I claim:

1. A method for shaping surfaces comprising the steps of using reactive atom plasma processing for shaping damage free surfaces.

2. The method of claim 1 wherein the process is carried out at about atmosphere temperature.

3. The method of claim 1 for shaping optical elements.

4. The method of claim 1 for shaping elements out of silicon.

5. The method of claim 1 for shaping silica glass optics.

6. The method of claim 1 for shaping aspheric optics.

7. The method of claim 1 operating in a subtractive manner.

8. The method of claim 1 that does not leave behind a contaminated redeposition layer.

9. The method of claim 1 using a plume of plasma.

10. The method of claim 1 using a plume of plasma operating as a sub-

aperture tool.

11. The method of claim 1 wherein a plume of plasma is translated across a workpiece.

12. The method of claim 1 wherein the emission spectrum is monitored to determine process rates.

13. The method of claim 1 using carbon tetrafluoride (CF_4) in argon to create the plasma.

14. The method of claim 1 using C_2F_6 in argon to create the plasma.

15. The method of claim 1 using silicon hexafluorine (SF_6) in argon to create the plasma.

16. An apparatus for shaping surfaces comprising:
a chamber;
a torch located in a chamber that can produce a plume of plasma;
a device that holds a workpiece; and
a mechanism for translating the torch across the workpiece.

17. The apparatus of claim 15 including:

a device for tuning the plasma.

18. The method of claim 1 operating an additive manner.

19. The method of claim for removing damage introduced by previous process steps.

20. The method of claim 1 for removing surface roughness.